國立成功大學

112學年度碩士班招生考試試題

編　號：129

系　所：系統及船舶機電工程學系

科　目：自動控制

日　期：0206

節　次：第 2 節

備　註：可使用計算機

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※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Consider a transfer function $G(s)=\dfrac{s^2+7s+2}{s^3+9s^2+26s+24}$, and answer the following questions:

i) Find the controller canonical form for $G(s)$. (10%)

ii) Find the observer canonical form for $G(s)$. (10%)

2. Given a nonlinear function as

$$\dot{x}(t)=F\big(x(t), u(t)\big)$$

where $x(t)$ is the $n\times 1$ state vector, $u(t)$ is the $p\times 1$ input vector, and $F\big(x(t), u(t)\big)$ is an $n\times 1$ function vector. Please linearize $\dot{x}(t)=F\big(x(t), u(t)\big)$ with respect to a nominal operating points (x_0, u_0). (20%)

3. Please realize a PID controller with using operational amplifiers (OPA) and passive components. (20%)

4. Consider a plant expressed as

$$\dot{z}=Az+Bu$$
$$y=Cz$$

Assume that the system can be transformed into the variable x and have a transformation with z as $z=Px$, please derive the transformed state space formulation and find P. (20%)

5.

i) Draw the Bode plot diagram for the transfer function $G(s)=\dfrac{(s+100)}{(0.5S+1)(s+20)}$. (10%)

ii) Find out the phase crossover frequency ω_p, the gain crossover frequency ω_g, phase margin PM and gain margin GM of the Bode plot as shown in Figure 1. (10%)

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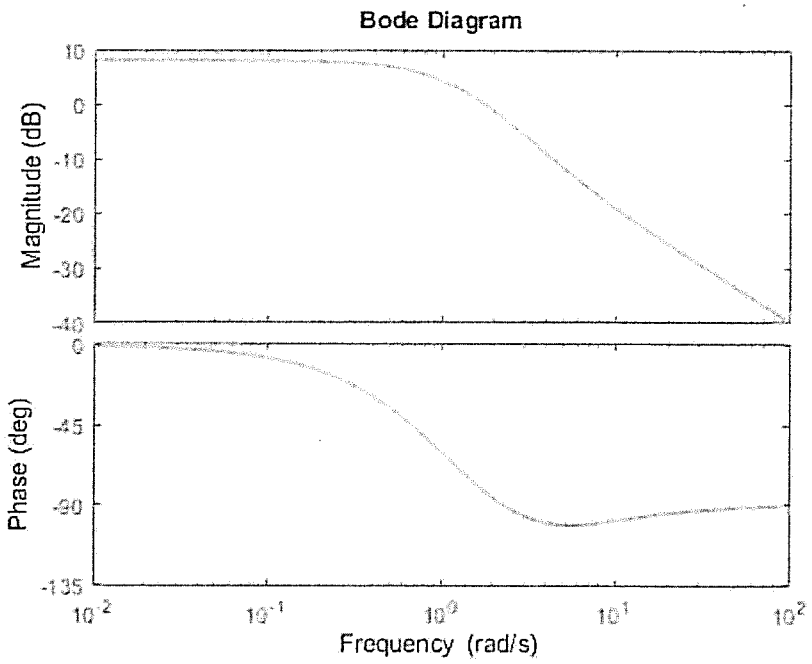

Figure 1. Bode Plot